

**PROCESS OF COMMUNICATION BETWEEN TWO TERMINALS OF A
COMPUTER NETWORK SUCH AS THE INTERNET AND TERMINAL FOR
IMPLEMENTING THE PROCESS**

A computer network such as the Internet makes it possible for a plurality of terminals, in particular facsimile machines, connected to the Internet to communicate with each other by electronic mail.

Electronic mail comprises a message, formed from a header and a body and, possibly, one or more enclosures formed by a data file which may be of various types (facsimile, sound, image, EXCEL, etc...). The header of the message comprises a plurality of fields containing, respectively, an electronic address of destination of the mail, an electronic address of provenance of the mail, the subject of the mail and descriptors of the format of the enclosure. The body of the message contains text.

Transmission between two facsimile machines of mail containing a facsimile as an enclosure, to take this example, is not generally direct. Thus the mail is first transmitted via the Internet, from the transmitting facsimile machine to a mail box in which it is stored until the receiving facsimile machine is connected to the Internet and downloads the mail from the mail box.

In contrast to two standard facsimile machines communicating between themselves via a telephone network such as the switched telephone network, STN, the two facsimile machines transmitting a facsimile by electronic mail do not establish a duplex communication between them via the Internet. The result is, in particular, that the transmitting facsimile machine cannot ask the receiving facsimile machine to transmit its capabilities or other additional information to it, as takes place during a telephone exchange protocol between two standard facsimile machines via the STN.

The invention thus originates from a problem of dialogue between two facsimile machines via the Internet.

The applicant has desired to be able to request the receiving facsimile machine or other receiving terminal, not only to transmit its capabilities, but also, in a more general manner, to carry out an operation of management of electronic mail.

To this end the invention relates to a process of communication by electronic mail between two terminals of a computer network during which, in the transmitting terminal, data controlling the execution of a management operation are inserted into electronic mail and the mail is sent to the receiving terminal and, in the receiving terminal, the meaning of the control data is sought and, if appropriate, the execution of the said operation is initiated.

The mail comprising a message, the said control data are advantageously inserted into the said message.

In the prior art, the electronic mail message, formed by a header and a body, was of a purely informative nature, its role consequently being passive. The invention consists of using such a message to transmit an instruction or a command, to be executed by the receiver and thus to make the role of the message active. Thus, for example, it is possible to insert, into the mail message, control data corresponding to a request for transmission of the capacities of the receiving terminal in order for the receiving terminal to transmit its capabilities to the transmitting terminal.

The mail comprising a file of specific format attached to the message and the said message comprising a field of descriptors of the file format, the said control data are inserted into the said descriptor field.

Thus a field provided to contain information describing the format of the data contained in the mail in order to transmit an instruction to the receiving terminal is used for remote control of the receiving terminal.

The invention also relates to a terminal for implementation of the process mentioned above, comprising means for receiving electronic mail and means for executing management

operations, characterised in that it also comprises means for seeking the meaning of control data for execution of a management operation, which are inserted into mail received, and means for initiating, if appropriate, the execution of the said management operation under the said control.

The invention will be better understood with the aid of the following description of a particular embodiment of the terminal of the invention and of a particular embodiment of the communication process of the invention, with reference to the attached drawing in which:

- Figure 1 illustrates an operational block diagram of the terminal of the invention and
- Figure 2 illustrates a schematic view of two terminals, such as that in Figure 1, connected to the Internet;

The process of the invention is a process of communication by electronic mail between two terminals 30, 40 of a computer network, in this case the Internet 100. In the particular example of the description, the two terminals 30, 40 are facsimile machines.

It will be recalled at this point that electronic mail generally comprises a message formed by a header and a body, to which a data file may possibly be attached. The data file has a specific format. The format of a facsimile file, ie. of a file containing facsimile data is TIFF-F. The header of the message comprises a plurality of fields which are in this case:

- a provenance field containing the electronic address of the facsimile machine transmitting the mail,
- a destination field containing the electronic address of the facsimile machine receiving the mail,
- a subject field containing the subject of the mail,
- an identifier field containing a mail identification reference and
- a descriptor field containing, if appropriate, "MIME descriptors" of the format of the file attached to the message.

The "MIME descriptors" are intended to give a MIME (Multipurpose Internet Mail

Extension) description of the format of the file. A MIME description generally comprises two words representing respectively a type of file and a sub-type of file. For a facsimile file of TIFF-F format, the MIME descriptors are "image/tiff", the word "image" representing the type of file (it is an image file) and the word "tiff" the sub-type of the file (it is one of the numerous types of image, in this case the facsimile image type). Some MIME descriptors contain the prefix "X-" signifying that these descriptors are not standard.

The body of the message contains text.

In the particular example of the description, in order to transmit a facsimile, or more precisely facsimile data, by electronic mail between the two facsimile machines 30, 40, a facsimile file containing the facsimile data is attached to the mail message.

The two corresponding facsimile machines 30, 40 are identical and each have access to the Internet 100 and a mail box 31, 41 with an electronic address on the Internet 100 with a provider 32, 42 of access to the Internet 100. For the sake of clarity the elements of the facsimile machine 30 and the corresponding elements of the facsimile machine 40 will be designated by the same references with and without an apostrophe respectively.

The facsimile machine 40 will now be described with reference to Figure 1.

The facsimile machine comprises a controller 25 for telephone connection to the Internet 100, connected by means of a modem 8 to a telephone network, in this case the switched telephone network 101, and intended to execute a telephone connection protocol with the access provider 42 in order to be connected to the Internet 100.

A reception controller 20 and a transmission controller 17 are connected to the controller 25 for telephone connection to the Internet 100.

The reception controller 20 is intended to download electronic mail contained in the mail box 41 of the facsimile machine during telephone communication with the access provider 42. A

decoder 19 is connected to the reception controller 20 and to a working memory 18. The decoder 19 is intended to decode the mail received, encoded according to encoding compatible with the Internet 100, in this case that of the MIME protocol. The working memory 18 is connected to a central unit 1 intended to control operation of the facsimile machine 40, explained hereinunder.

An information-capture controller 24, connected to the working memory 18, is intended to check the header of the received mail message in order to read and to capture information as will be explained in the description of the communication process. The controller 24 is connected to the central unit 1.

A controller 23 for capturing command words, connected to the working memory 18, is intended to check the header of the received mail message and, more particularly in this case, the descriptor field of the header, in order to read and to capture one or more command words for execution of a management operation, as required.

Management operation is meant to designate any management operation aiming to manage the electronic mail in the facsimile machine, such as in particular the printing of mail, the sending of mail, the recording of capabilities of a corresponding facsimile machine, the sending of an acknowledgement of reception, the sending of its capabilities to a correspondent and the sending of notification of non-comprehension.

The capture controller 23 is connected to an identification controller 22 intended to seek the meaning of a command word captured by the controller 23, in other words to identify the captured word with the management operation execution command. The identification controller 22 is connected to the central unit 1.

Finally, a controller 21 for determining file formats, connected to the working memory 18, is intended to check the descriptor field of the header of a received message in order to determine if the facsimile machine 40 can reconstruct or edit the facsimile by printing or displaying on a screen. The controller 21 is connected to the central unit 1.

The transmission controller 17 is connected to a transmission memory 16 intended to contain electronic mail awaiting transmission. The transmission memory 16 is connected to an electronic mail preparation controller 14, with an encoder 15 being interposed and intended to encode mail to be transmitted according to the encoding of the MIME protocol.

The mail preparation controller 14 connected to the central unit 1 comprises software to prepare and create electronic mail to be transmitted, with the aid of information provided by the central unit 1.

The facsimile machine 40 also comprises a controller 3 for image analysis, intended to analyse and digitise facsimile images, and a print controller 5.

The image analysis controller 3 is connected to the central unit 1, with a facsimile image memory 4 being interposed.

The print controller 5 is connected to a print preparation controller 7 by means of a print memory 6. The controller 7 is connected to the central unit 1.

The facsimile machine 40 also comprises a memory 9 containing a directory of correspondents, in which the identities of a plurality of corresponding facsimile machines are listed, associated with their electronic addresses and their capabilities, and a memory 11 for storage of mail containing mail identification references, each associated with a state indicator explained hereinunder and, possibly, with a copy of the mail transmitted. A controller 10 for management of the directory of correspondents is connected to the memory 9 and to the central unit 1. A controller 12 for management of mail is connected to the memory 11 and to the central unit 1.

A memory 13 connected to the central unit 1 contains standard text for acknowledgement of reception, standard text for notification of non-comprehension and command words for execution of a management operation.

Finally, the facsimile machine 40 comprises a user interface 2 comprising a display screen, an input keypad and software means for creating input interfaces intended to be displayed on the screen and to permit a user to input, in particular, information required to prepare electronic mail, to manage the directory of correspondents 9 and to manually control the execution of electronic mail management operations.

The process of communication by electronic mail between the two facsimile machines 30, 40 corresponding to the operation of the facsimile machines will now be described.

Several examples will be explained.

Example 1: Acknowledgement of reception.

Example 1 relates to the sending, by the transmitting facsimile machine 30 to the receiving facsimile machine 40, of electronic mail containing a message to which a facsimile file is attached, and the return, by the receiving facsimile machine 40 to the transmitting facsimile machine 30, of an acknowledgement of reception.

The mail to be sent is prepared in the transmitting facsimile machine 30. A user introduces a facsimile image into the controller 3' for image analysis, which analyses and digitises the facsimile image and stores the facsimile data in the memory 4'.

The central unit 1' supplies the mail preparation controller 14' with the electronic address of the receiving facsimile machine 40, the subject of the mail, the MIME descriptors of the facsimile file format which is stored in the memory 4', and text. The address of the receiving facsimile machine, the subject of the mail and the text are input by the user using the interface 2'. The electronic address of the transmitting facsimile machine 30 is prerecorded in the mail preparation controller 14'. The address of the transmitting facsimile machine 30, the address of the receiving facsimile machine 40, the subject and the MIME descriptors are respectively inserted into the provenance field, the destination field, the subject field and the descriptor field of the header of the mail message and the text is inserted into the body of the message.

Furthermore, with the aid of the user interface 2', the user initiates a command for transmission of an acknowledgement of reception and, under the control of the central unit 1', the controller 14' inserts the command word "X-Ack" for commanding transmission of an acknowledgement of reception into the descriptor field of the message header.

The facsimile image stored in the memory 4' is attached to the mail message by the controller 14' under the control of the central unit 1'.

Finally, the mail management controller 12' of the memory 11' supplies a mail identification reference to the transmission preparation controller 14' which inserts this reference into the identifier field of the header of the message. The controller 12' also copies the reference of the mail, associating it with an indicator of the state of awaiting transmission, in the mail memory 11'. The encoder 15' encodes the mail according to the MIME protocol and stores it in the transmission memory 16'.

In order to send the mail, the connection controller 25' executes the telephone connection protocol with the access provider 32 and, after connection to the Internet 100, the transmission controller 17' sends the mail via the Internet 100 to the receiving facsimile machine 40. After transmission of the mail, the management controller 12' replaces the awaiting transmission indicator associated with the mail reference by an indicator of a state of awaiting acknowledgement of reception in the memory 11'. The mail is passed via the Internet 100 until it reaches the mail box 41 of the facsimile machine 40 in which it is stored. In order to receive the mail, the facsimile machine 40 is connected to its access provider 42 by a telephone connection, and the reception controller 20 downloads the mail from the mail box 41. The decoder 19 decodes the mail which is then stored in the working memory 18.

The controller 21 for determining file formats checks the descriptor field of the received mail message, captures the MIME descriptors and deduces therefrom the format of the file attached to the message. This format being the TIFF-F format which can be understood by the facsimile machine 40, the controller 21 authorises the reconstruction of the mail received, in this case by printing, and signal it to the central unit 1. Under the control of this central

unit, the mail is then printed by the print controller 5.

The controller 23 for capturing command words also checks the descriptor field, captures the command word "X-Ack" and supplies it to the identification controller 22. This controller seeks the meaning of the word "X-Ack", identifies it with a transmission command for acknowledgment of reception and transmits this command to the central unit 1. Under the control of the central unit 1, the information-capture controller 24 checks the message header, captures the address of the transmitting facsimile machine 30 and the mail reference, and provides this information to the mail preparation controller 14. The central unit 1 also supplies the controller 14 with the standard text for acknowledgement of reception and the validation command word for the reception of mail, which are stored in the memory 13.

The mail preparation controller 14 prepares mail for acknowledging reception by inserting the address of the transmitting facsimile machine 30 into the destination field, the prerecorded address of the receiving facsimile machine 40 into the provenance field, the acknowledgement of reception text into the body of the message and the command word for validation of reception into the descriptor field. The mail is encoded by the encoder 15, then stored in the transmission memory 16 and, finally, the transmission controller 17 sends the mail to the transmitting facsimile machine 30, before the connection controller 25 is disconnected from the Internet 100. The mail containing the facsimile and the mail for acknowledging reception are thus respectively received and transmitted during a single instance of telephone communication with the access provider 42. The mail for acknowledging reception is passed via the Internet 100 to the mail box 31 of the transmitting facsimile machine 32 [sic] in which it is stored.

In the transmitting facsimile machine 30, after connection to the Internet 100, the reception controller 25 downloads the mail for acknowledging reception which is decoded and then stored in the working memory 18'. The command word capture controller 23' checks the descriptor field of the mail message and captures the command word for validation of reception.

The identification controller 22' seeks the meaning of this command word, identifies it with a command for validating reception and supplies the command to the central unit 1'. Under the control of the central unit 1', the information-capture controller 24' checks the header of the message, captures the mail reference and supplies it to the mail management controller 12' of the memory 11'. This controller checks the content of the memory 11' in order to find the mail reference, then replaces the associated indicator of the state of awaiting acknowledgement of reception by an indicator indicating that the reception is validated.

In another embodiment, in the transmitting facsimile machine 30, before sending the mail to the receiving facsimile machine 40 it is copied into the mail memory 11' with the corresponding reference. After the mail has been sent, the period of time since the state indicator associated with the mail reference has indicated a state of awaiting acknowledgement of reception is evaluated regularly. If this period exceeds a predetermined threshold, in this case forty eight hours, the indicator of the state of awaiting acknowledgement of reception is replaced by an alarm state indicator. Then, under the control of the controller 12', a copy of the mail stored in the memory 11' is transferred into the print memory 16', and the transmission controller 17' again sends the mail to the receiving facsimile machine 40.

In the following examples the operations of the various elements of the facsimile machines 30, 40 are essentially analogous to what has just been described and differ only by what will now be described.

Example 2: Printing the received mail

In the transmitting facsimile machine 30, under the control of the user, the mail preparation controller 14' inserts the word "X-Print" for controlling printing into the descriptor field of the mail message which is then sent to the receiving terminal 40 as described above. In the receiving facsimile machine 40, after downloading of the mail, the capture controller 23 captures the command word "X-Print", the identification controller 22 seeks the meaning of this word, identifies it with a print command and, under the control of the central unit 1, the print controller 5 prints the received mail.

Example 3: Sending of the capabilities of the transmitting facsimile machine

In the transmitting facsimile machine 30, under the control of the user, the controller 14' inserts a capability-recording command word into the descriptor field of a mail message to be sent and the capabilities of the transmitting facsimile machine 30 into an associated information field. The transmitting facsimile machine 30 then sends the mail to the receiving facsimile machine 40. In the receiving facsimile machine 40 the capture controller 23 captures the command word, the identification controller 22 seeks its meaning and identifies it with a command for the recording of capabilities, the capture controller 24 captures the capabilities of the transmitting facsimile machine 30 and, under the control of the central unit 1, the controller 11 records them in the directory of correspondents 9.

Example 4: Request for capabilities to the receiving facsimile machine

In this case, in the transmitting terminal 30, under the command of the user, the controller 14' inserts the command word for the transmission of capabilities of the receiving terminal 40 into the descriptor field of the mail message to be sent, and the facsimile machine 30 sends the mail to the receiving terminal 40. In this latter, the capture controller 23 captures the command word, the identification controller 22 seeks its meaning and identifies it with a command for the transmission of capabilities and, as in Example 3, the controller 14 prepares mail containing, in a descriptor field, a command for the recording of capabilities and, in an associated information field, the capabilities of the receiving facsimile machine 40. The facsimile machine 40 sends the mail to the transmitting facsimile machine 30 in which the capabilities of the facsimile machine 40 are recorded in the directory of the correspondent 9', as explained in Example 3.

Example 5: Request for forwarding to another receiving facsimile machine

In the transmitting facsimile machine 30, under the control of the user, the controller 14' inserts a command word for forwarding to another receiving facsimile machine and the electronic address of this other receiving facsimile machine, respectively into the descriptor

field and into an associated information field of the mail message to be sent. The transmitting facsimile machine 30 sends the mail to the receiving facsimile machine 40 in which the controller 23 captures the command word, the controller 22 seeks its meaning and identifies it with a forwarding command, the controller 24 captures the address of the facsimile machine receiving the forwarded message and finally the controller 14 proceeds with changing the address of the received mail before sending it to the facsimile machine receiving the forwarded message.

Example 6: Notification of non-comprehension

In this example, the transmitting facsimile machine 30 sends the receiving facsimile machine 40 mail containing a message to which a data file is attached having a specific format such that the facsimile machine 40 is not capable of reading and thus editing or reconstructing the file. The header of the message in this case contains a field of MIME descriptors of the format of the file.

In the receiving terminal 40, the connection controller 25 is connected to the Internet 100, the reception controller 20 downloads the mail and stores it in the working memory 18. The controller 21 for determining file formats checks the descriptor field and captures the MIME descriptors of the format of the file attached to the message, deduces therefrom that the facsimile machine 40 is unable to reconstruct the file and signals it to the central unit 1. This central unit then commands the capture controller 24 to capture the electronic address of the transmitting terminal 40 from the provenance field of the message and provides this address as well as the text of the notification of non-comprehension stored in the memory 13 to the mail preparation controller 14. The controller 14 prepares electronic mail containing, in a destination field, the address of the transmitting facsimile machine 30, in the provenance field, the address of the receiving facsimile machine 40, in the subject field, a key word of notification of non-comprehension, automatically recognisable by the transmitting facsimile machine 30, and, in the body of the message, the text of the notification of non-comprehension. The mail is then encoded, stored in the transmission memory 16 and sent by the transmission controller 17 to the transmitting facsimile machine 30 via the Internet 100.

Figure 10 shows the results of the analysis of variance for the effect of the number of trials on the mean number of correct responses. The results show that the number of trials had a significant effect on the mean number of correct responses, $F(4, 116) = 10.1, p < 0.001$. The mean number of correct responses increased with the number of trials, from 1.5 for 1 trial to 4.5 for 5 trials. The mean number of correct responses for 1 trial was significantly lower than for 2 trials, $F(1, 29) = 10.1, p < 0.001$. The mean number of correct responses for 2 trials was significantly lower than for 3 trials, $F(1, 29) = 10.1, p < 0.001$. The mean number of correct responses for 3 trials was significantly lower than for 4 trials, $F(1, 29) = 10.1, p < 0.001$. The mean number of correct responses for 4 trials was significantly lower than for 5 trials, $F(1, 29) = 10.1, p < 0.001$.

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